

WHAT IS CLAIMED IS:

1. A blood sugar level measuring apparatus comprising:

a heat amount measuring unit for measuring a plurality of temperatures derived from the body surface in order to obtain information used for calculating the amount of convective heat transfer and the amount of radiation heat transfer concerning the dissipation of heat from the body surface;

an oxygen volume measuring unit for obtaining information concerning the volume of blood oxygen;

a storage unit for storing the relationships between the individual parameters corresponding to the multiple temperatures and blood oxygen volume and blood sugar levels;

a computing unit for converting the measurement values provided by the heat amount measuring unit and the oxygen volume measuring unit into parameters, and computing a blood sugar level by applying the parameters to the relationships stored in the storage unit; and

a display unit for displaying the blood sugar level computed by the computing unit,

wherein the oxygen volume measuring unit comprises a blood flow volume measuring unit for obtaining information concerning the volume of blood flow and a heat transfer prevention means for preventing heat transfer to the blood flow volume measuring unit from the vicinity thereof.

2. The blood sugar level measuring apparatus according to claim 1, wherein the blood flow volume measuring unit comprises:

a body-surface contact unit;

an adjacent temperature detector disposed adjacent the body-surface contact unit;

an indirect temperature detector for detecting the temperature at a position

distanced away from the body-surface contact unit; and

a heat-conducting member connecting the body-surface contact unit and the indirect temperature detector, wherein

the heat transfer prevention means prevents heat transfer to the heat-conducting member.

3. The blood sugar level measuring apparatus according to claim 1, further comprising at least one supporting column member for installing the blood flow volume measuring unit,

wherein the heat transfer prevention means is a heat insulator disposed between the heat-conducting member and the supporting column member and the heat insulator has a smaller heat conductivity than the supporting column member.

4. The blood sugar level measuring apparatus according to claim 3, wherein the heat insulator is formed of a material having the properties of any of a fiber material, a foaming material, or a micro dust layer material.

5. The blood sugar level measuring apparatus according to claim 3, wherein the heat insulator has a heat conductivity of 0.0005 W/mK to 0.02 W/mK.

6. The blood sugar level measuring apparatus according to claim 1, further comprising at least one supporting column member for installing the blood flow volume measuring unit, wherein the heat transfer prevention means is an end part of the supporting column member which is adjacent to the heat-conducting member and has a smaller diameter at a position adjacent to the heat-conducting member than the maximum diameter of the supporting column member.

7. The blood sugar level measuring apparatus according to claim 6, wherein the end part has point contact with the heat-conducting member.

8. The blood sugar level measuring apparatus according to claim 6, wherein the end part has linear contact with the heat-conducting member.

9. The blood sugar level measuring apparatus according to claim 1, further comprising at least one supporting column member for installing the blood flow volume measuring unit, wherein

the heat transfer prevention means comprises a connecting part projecting from the supporting column member and a holding part which is connected to the connecting part and holds the heat-conducting member.

10. The blood sugar level measuring apparatus according to claim 1, wherein the oxygen volume measuring unit further comprises an optical measuring unit for obtaining blood hemoglobin concentration and hemoglobin oxygen saturation.

11. The blood sugar level measuring apparatus according to claim 10, wherein the optical measuring unit comprises:

a light source for generating light of at least two different wavelengths;

an optical system for irradiating the body surface with light emitted by the light source; and

a photodetector for detecting the light with which the body surface has been irradiated.

12. The blood sugar level measuring apparatus according to claim 1, wherein the heat amount measuring unit comprises:

an ambient temperature detector for measuring the ambient temperature; and

a radiation temperature detector for measuring the radiation heat from the body surface.

13. A non-invasive blood sugar level measuring apparatus comprising:

- a temperature measuring unit for measuring a plurality of temperatures from a body surface;

- a blood flow volume measuring unit for obtaining information concerning the volume of blood flow based on the results of measurement by the temperature measuring unit;

- an oxygen volume measuring unit for determining the volume of blood oxygen based on the result of measurement by the blood flow volume measuring unit;

- a storage unit for storing the relationships between individual parameters corresponding to the multiple temperatures, the volume of blood oxygen and the volume of blood flow, and blood sugar levels;

- a computing unit for converting the measurement values provided by the temperature measuring unit, the blood flow volume measuring unit and the oxygen volume measuring unit into parameters, and then applying the parameters to the relationships stored in the storage unit in order to compute a blood sugar level; and

- a display unit for displaying the blood sugar level computed by the computing unit, wherein

- the blood flow volume measuring unit has a heat transfer prevention means for preventing heat transfer to the blood flow volume measuring unit from the vicinity thereof.

14. A blood sugar level measuring apparatus comprising:

- an ambient temperature measuring unit for measuring the ambient temperature;

- a body-surface contact unit to be brought into contact with a body surface;

- a radiation heat detector for measuring the radiation heat from the body surface;

- a heat-conducting member disposed in contact with the body-surface contact unit;

- a heat insulator disposed in contact with the heat-conducting member;

- a contact part for covering an open end of the heat-conducting member in

contact with the body-surface contact unit;

an adjacent temperature detector for detecting the temperature of the contact part;

an indirect temperature detector disposed adjacent the heat-conducting member and away from the body-surface contact unit for detecting the temperature at a position distanced away from the body-surface contact unit;

a light source for irradiating the body-surface contact unit with light of at least two different wavelengths;

a photodetector for detecting the light with which the body surface has been irradiated;

a converting unit for converting the outputs from the adjacent temperature detector, the indirect temperature detector, the ambient temperature measuring unit, the radiation heat detector, and the photodetector into individual parameters;

a storage unit for storing the relationships between the parameters and blood sugar levels;

a computing unit for computing a blood sugar level by applying the individual outputs to the relationships stored in the storage unit; and

a display unit for displaying the blood sugar level produced from the computing unit.

15. The blood sugar level measuring apparatus according to claim 14, further comprising at least one supporting column member for installing the heat-conducting member, wherein the heat insulator has a lower heat conductivity than the supporting column member.

16. The blood sugar level measuring apparatus according to claim 14, further comprising at least one supporting column member for installing the heat-conducting member, wherein the heat insulator is disposed between the heat-conducting member and the supporting column member.

17. A blood sugar level measuring apparatus comprising:

- an ambient temperature measuring unit for measuring the ambient temperature;
- a body-surface contact unit to be brought into contact with a body surface;
- a radiation heat detector for measuring the radiation heat from the body surface;
- a heat-conducting member disposed in contact with the body-surface contact unit;

- a supporting column member which supports the heat-conducting member and has a smaller diameter at a site adjacent to the heat-conducting member than the maximum diameter of the supporting column member;

- a contact part for covering an open end of the heat-conducting member in contact with the body-surface contact unit;

- an adjacent temperature detector for detecting the temperature of the contact part;

- an indirect temperature detector disposed adjacent the heat-conducting member and away from the body-surface contact unit for detecting the temperature at a position distanced away from the body-surface contact unit;

- a light source for irradiating the body-surface contact unit with light of at least two different wavelengths;

- a photodetector for detecting the light with which the body surface has been irradiated;

- a converting unit for converting the outputs of the adjacent temperature detector, the indirect temperature detector, the ambient temperature measuring unit, the radiation heat detector, and the photodetector into individual parameters;

- a storage unit for storing the relationships between the parameters and blood sugar levels;

- a computing unit for computing a blood sugar level by applying the individual outputs to the relationships stored in the storage unit; and

- a display unit for displaying the blood sugar level produced from the computing

unit.

18. The blood sugar level measuring apparatus according to claim 17, wherein the end part has a smaller diameter at a site adjacent to the heat-conducting member than the other parts of the supporting column member.

19. The blood sugar level measuring apparatus according to claim 17, wherein the end part is in contact with the heat-conducting member through linear contact.

20. The blood sugar level measuring apparatus according to claim 17, wherein the end part is in contact with the heat-conducting member through point contact.